

EXHIBIT 29

Head 4:	
Z-slide (y/n):	
Stroke Adjust (y/n)	
Rotary (y/n):	
Size 7 or 10:	
Valve:	
Alarm Air Range:	
O-ring material:	
Laser Height (y/n):	No
Laser Pointer (y/n):	No
Prog. Camera (y/n):	Yes
Head Loading:	Standard 3 Air 2 Valve
Custom:	No
Double tooling:	No
Other:	
Conveyor:	
Type: (Belt/Chain)	None
Direction (Lo/R, Ri/L):	
Conveyor length:	
Conveyor height:	
SEMA:	
Bi-Directional (y/n)	
Upstream/Downstream	
PIP Sensors:	
Auto width adj.:	
Hand crank width adj.:	
Lift and locate:	
Board locators:	
Board stops: (Type)	
Quantity on front rail:	
Quantity on back rail:	
Part Fixturing:	
Fix Fixture:	Yes
Part present sensor:	Yes
Custom Fixture:	No
Work height:	No
Cycle Start:	
Hand start:	Hand Start
Single zero force:	Yes
Double zero force:	No
Controller (y/n)	No
Push button:	Yes

4/27/2009

Guarding:		
Doors:	Yes <input checked="" type="checkbox"/>	
Interlocks: (y/n)	Yes <input checked="" type="checkbox"/>	
Light curtain:	No	
Light tower:	No	
Process Controls:		
Flow Monitor:	No	
Remote transmitter: (y/n)	-	
Gear style: (y/n)	-	
Low level:	No	
Auto. Crossover:	No	
Computer:	Yes	Customer Supplied
Portals OIT: (y/n)	No	
Bar code reader:	No	
A/R Box: (y/n)	No	
Data Logging:	No	
Needle Calibration:	No	
Black light:	No	
Cycle rate (sec.)	Unknown	
Air Requirements:		
PSI:	80 - 100 <input checked="" type="checkbox"/>	
Dry: (y/n)	Yes	
Lubricated: (y/n)	No	
CFM:	< 10	
Ventilation:		
Minimum CFM:	100	
Flange dia.: (4" or 5")	5"	
PVA blower: (y/n)	No	
Blower exit diameter:		
Exhaust switch: (y/n)	Yes <input checked="" type="checkbox"/>	
Supply Voltage:		
120VAC:	Yes <input checked="" type="checkbox"/>	
220VAC:	No	
Frequency:	60 Hz <input checked="" type="checkbox"/>	
Current:	12A <input checked="" type="checkbox"/>	
Phase:	Single <input checked="" type="checkbox"/>	
Coating Materials:		
Material A:	SCX NVCH	
Material B:		
Solvent:	None	
Kalrez O-rings? (y/n)	Yes	

4.272099

connected. The *DOOR BYPASS* key switch is provided to allow maintenance personnel access to the work area without disconnecting power. This bypass switch only allows access during Manual and Calibration modes.

Light Curtain

Some machines are equipped with an optional light curtain. The light curtain is redundant and self-checking. The control signals from the light curtain are included as safety devices in the safety circuit. On machine power up, the light curtain must be reset by turning the key switch to 'Reset' for at least ¼ second.

Exhaust Fan

Some machines are equipped with an exhaust fan. The exhaust fan is provided to exhaust fumes from the work area. The exhaust flange should be connected to an appropriate ducting system that is capable of receiving 150 CFM (cubic feet per minute). Insufficient airflow through the exhaust system generates an error.



NOTE: Installed safety devices vary from model to model.

Operation

Startup Procedure

- 1) Check the fluid and air pressures.
- 2) Close all doors and turn the *DOOR BYPASS* key switch to the OFF position (If applicable).
- 3) Engage the *EMERGENCY STOP* button.
- 4) Turn on main power using the red rotary switch at the front or rear of the machine (Black "rocket" switch on PVA250™ and PVA250E™ models).

Light Tower Operation

Three stacked indicator lights and a buzzer are used to indicate the status of the machine. The lights are green, amber, and red with green on the bottom, amber in the middle and red on top. The buzzer is located below the green light. The lights are visible from all sides of the machine. The indicators operate as follows. The light tower may help you be your first clue for solving a problem.

- o The green indicator is on when the machine is in cycle and producing parts. It is off at all other times.
- o The amber indicator is on when the machine is in Auto Cycle and ready to produce parts, but can not cycle due to an external material handling problem (no incoming parts or no room to unload parts). PVA750™ and PVA2000C™ models are equipped with a light tower but not an amber light.
- o The red indicator is on steady when the machine is not in Auto Cycle due to operator intervention. It will flash when the machine is in cycle, but cycle is halted due to a machine problem. It is off at all other times.
- o The buzzer cycles with the red indicator during machine errors.

Table 4 – Light Tower & Buzzer Status



State	Red	Amber	Green	Buzzer
Cycle Stop	ON	OFF	OFF	OFF
Auto Cycle	OFF	ON	OFF	OFF
In Cycle	OFF	OFF	ON	OFF
Machine Error	FLASH	OFF	OFF	FLASH

Exhaust Verification

Once the workcell has initialized, most models will perform an exhaust flow verification process. If initialization fails, consult the section Startup Errors on page 44. During this process, and whenever the workcell is in operation the exhaust flow rate is monitored via the on board pressure differential switch. The workcell must exhaust at a rate no less than 150 cubic feet per minute, otherwise a critical fault will occur shutting the motors down. The verification process will also attempt to evacuate any potential vapors that may already exist in the work area of the work-

commands in a path program. The error selection turns the process verification check on and off. The error ON/OFF selection cannot be overridden by commands in a path program.

[F1] **EXIT** – Leave Flow mode and return to Cycle Stop.

[F3] **cc UP** – Increase the material target level. Maximum is 99 cc.

[F4] **cc DOWN** – Decrease the material target level. Minimum is 0.00 cc.

[F5] **DEV UP** – Increase the allowable deviation. Maximum is 99%.

[F6] **DEV DOWN** – Decrease the allowable deviation. Minimum is 0%.

[F7] **Error ON** – Turn the material flow error checking on. (default)

[F8] **Error OFF** – Turn the material flow error checking off.

Calibration Procedures

The workcell has one of three calibration methods: Standard, Operator Defined and Sensor Defined. If a Sensor Defined or Operator Defined method is installed on the workcell, the machine may or may not automatically enter its particular calibration mode following the homing sequence depending on the application the workcell was set up for. See page 32 for particulars on operating the workcell during a calibration sequence.

Standard Needle Calibration

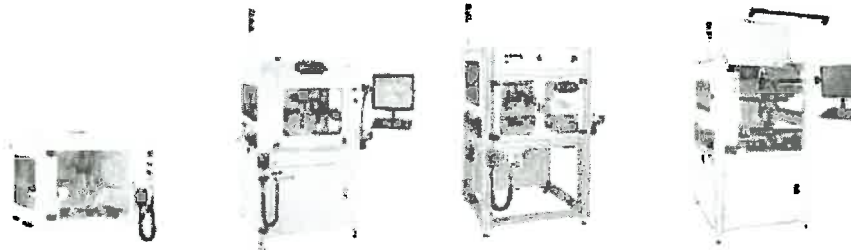
The simplest calibration procedure requires the operator to visually inspect the position of a needle with respect to a calibration point (such as cross-hairs). If the needle is not directly above the point, the operator must physically reposition the needle so it is above the calibration point.

Operator Defined Needle Calibration

This method is dependent upon the operator utilizing the trackball to redefine the coordinate system according to the positioning of a specific needle or dispense head. This process is optional. If the specific needle is located in the desired position this process can be skipped.

The calibration routine automatically runs when the machine is powered on or if the controller is reset. The head moves to a calibration point (specified in the main program). When at the calibration position the operator has control of the axes. Using the trackball, the position of the needle tip can be redefined in reference to a calibration point (such as cross-hairs). This process can also be run manually through the CAL function key if a needle needs to be replaced for any reason during operation.

Selective Coating Equipment Comparison



	PVA350	PVA650	PVA2000	PVA6000
Repeatability	.025mm	.025mm	.025mm	.025mm
Max Speed	500mm/sec	670mm/sec	670mm/sec	670mm/sec
Encoder Resolution	5 micron	5 micron	5 micron	5 micron
Gantry Drive System	Closed Loop DC servo, Ballscrew Drive	Closed Loop DC servo, Ballscrew Drive	Closed Loop DC servo, Ballscrew Drive	Closed Loop DC servo, Ballscrew Drive
Max Acceleration	0.25 g	0.5 g	0.5 g	0.5 g
Travel				
Initial XY Axis Travel	400mm x 400mm	500mm x 500mm	500mm x 500mm	500mm x 500mm
Z Axis Travel	90mm	90mm	100mm	100mm
Board Handling				
Conveyor Type	N/A	Flat Edge Belt or Chain	Flat Edge Belt or Chain	Flat Edge Belt or Chain
Min Conveyor Width	N/A	50mm	50mm	50mm
Above Board Clearance	70mm	70mm	62mm (standard) 100+mm (optional)	75mm (standard) 100+mm (optional)
Under Board Clearance	80mm	70mm	100mm (standard)	100mm (standard)
Transport Height	N/A	940mm to 965mm	940mm to 965mm	940mm to 965mm
Conveyor Protocol	N/A	SMEMA	SMEMA	SMEMA
Standard Board Sizes	Up to 300mm Depending on Options	50mm-457mm Depending on Options	50mm-457mm Depending on Options	50mm-457mm Depending on Options
Facilities				
Power	120 to 240 VAC, 50/60Hz	120 to 240 VAC, 50/60Hz	120 to 240 VAC, 50/60Hz	120 to 240 VAC, 50/60Hz
Air Supply	<10 CFM at > 80 PSI (5.5 bar) Filtered @ 5microns	<10 CFM at > 80 PSI (5.5 bar) Filtered @ 5microns	<10 CFM at > 80 PSI (5.5 bar) Filtered @ 5microns	<10 CFM at > 80 PSI (5.5 bar) Filtered @ 5microns
Footprint	945mm x 832mm x 794mm	1219mm x 941mm x 1607mm	1219mm x 1097mm x 1651mm	1219mm x 1257mm x 1667mm
Exhaust	300cfm minimum	300cfm minimum	300cfm minimum	300cfm minimum
Features				
Four-Axis	Option	Option	Option	Option
Bar Code Reading	Option	Option	Option	Option
Passive Programming	Option	Option	Option	Option
Camera	Option	Option	Option	Option
XY Fiducial Camera	Option	Option	Option	Option
Part Shutter	Option	Option	Option	Option
Exhaust Blower	Option	Option	Option	Option
PathMaster Software	Standard	Standard	Standard	Standard
Offline Programming	Standard	Standard	Standard	Standard
Onboard Computer	Option	Standard	Option	Standard
Flow Monitoring	Option	Option	Option	Option
Dual/Multi Head Tooling	Option	Option	Option	Option

PVA Patents

PVA holds four US patents, including the only TRUE four-axis motion capability featuring patented tilt and servo rotation control (4 axis patent – #6447847), and the atomized spray valve technology (ES Valve patent – #6523757).



www.pva.net

From: Alex Duggan
Sent: Friday, April 24, 2009 8:59 AM
To: 'nicholas.wong@spacex.com'
Subject: PVA Machine Specifications
Attachments: W3267.doc

Hi Nick,

I received your order for a PVA 350 from Frank Hart and I have created the preliminary machine specifications. Please look them over carefully for errors and fill in any missing information indicated by red text. Once the specifications have been completed and verified, we can begin production of your machine. If you have any questions, please let me know.

Thanks,
Alex

--

Alex Duggan
Project Engineer

PVA
15 Solar Drive
Halfmoon, NY 12065
518-371-2684 ext. 228

Workcell Specification

Customer: **SpaceX**

Rev.: A

Job Number: SPCX2115

Rev. Date:

Rev. Description:

Date Created: **04.24.09**

Date Completed:

Engineer:

Options	#1	Notes
	W3267	
Machine Type		
250,350,650,850,2000,3000	350	
Custom (y/n)	No	
Motion Axes:	3	
Controller Axes:	4	
Controller: (1500/2000)	2000	
X-Stroke:	~400 mm	
Y-Stroke:	~400 mm	
Z-Stroke:	~90 mm	
CE required: (y/n)	No	
Outlet type(Country)	N/A	
Head 1:	Spray Valve	
Z-slide (y/n):	Yes	
Stroke Adjust: (y/n)	No	
Rotary (y/n):	No	
Size 7 or 10:	-	
Valve:	FCS300-ES	
Atom Air range:	0 - 5 psi	
O-ring material:	Kalrez	
Head 2:	Dispense Valve	
Z-slide (y/n):	Yes	
Stroke Adjust: (y/n)	No	
Rotary (y/n):	Yes	
Size 7 or 10:	7	
Valve:	FCM100	
Atom Air range:	-	
O-ring material:	Kalrez	
Head 3:		
Z-slide (y/n):		
Stroke Adjust: (y/n)		
Rotary (y/n):		
Size 7 or 10:		
Valve:		
Atom Air range:		
O-ring material:		

9/8/2017
PVA-1658

Head 4:		
Z-slide (y/n):		
Stroke Adjust: (y/n)		
Rotary (y/n):		
Size 7 or 10:		
Valve:		
Atom Air range:		
O-ring material:		
Laser Height (y/n):	No	
Laser Pointer (y/n):	No	
Prog. Camera (y/n):	Yes	
Head tooling:	Standard 3 Axis, 2 Valve	
Custom:	No	
Double tooled:	No	
Other:	-	
Conveyor:	None	
Type: (Belt/Chain)		
Direction (LtoR, RtoL)		
Conveyor length:		
Conveyor height:		
SMEMA:		
Bi-Directional: (y/n)		
Upstream/Downstream		
PIP Sensors:		
Auto width adj.:		
Hand crank width adj.:		
Lift and locate:		
Board locators:		
Board stops: (Type)		
Quantity on front rail:		
Quantity on back rail:		
Part Fixturing:	Yes	
Flex Fixture:	Yes	
Part present sensor:	No	
Custom Fixture:	No	
Work height:	-	
Cycle Start:	Hand Start	
Hand start:	Yes	
Single zero force:	No	
Double zero force:	No	
Controller: (y/n)	No	
Push button:	Yes	

9/8/2017
PVA-1659

Guarding:		
Doors:	Yes	
Interlocks: (y/n)	Yes	
Light curtain:	No	
Light tower:	No	
Process Controls:		
Flow Monitor:	No	
Remote transmitter: (y/n)	-	
Gear style: (y/n)	-	
Low level:	No	
Auto Crossover:	No	
Computer:	Yes	Customer Supplied
Portal OIT: (y/n)	No	
Bar code reader:	No	
A/B Box: (y/n)	No	
Data Logging:	No	
Needle Calibration:	No	
Black light	No	
Cycle rate (sec.)	Unknown	
Air Requirements:		
PSI:	80 - 100	
Dry: (y/n)	Yes	
Lubricated: (y/n)	No	
CFM:	< 10	
Ventilation:		
Minimum CFM:	300	
Flange dia. : (4" or 5")	5"	
PVA blower: (y/n)	No	
Blower exit diameter:	-	
Exhaust switch: (y/n)	Yes	
Supply Voltage:		
120VAC:	Yes	
220VAC:	No	
Frequency:	60 Hz	
Current:	12A	
Phase:	Single	
Coating Material:		
Material A:	Unknown	Please Provide
Material B:		
Solvent:	Unknown	Please Provide
Kalrez O-rings? (y/n)	Yes	

9/8/2017
PVA-1660

Material Delivery:		
Pressure vessel:		
1gal:		
2gal:	2	Feeding both valves
5gal:		
10gal:		
Cartridge Supply:		
2.5oz:		
6oz:		
12oz:		
20oz:		
32oz:		
Cartridge drive:		
Servo:		
Pneumatic:		
Syringe Supply:		
3cc:		
5cc:		
10cc:		
30cc:		
50cc:		
5 gal. Pumping System:		
Pump ratio:		
Solvent Cup(s):	2	
Purge Pan/Cup(s):	2	
Other:		
Spare parts kit:		

9/8/2017
PVA-1661

From: Ted St. Marie
Sent: Monday, October 14, 2013 1:34 PM
To: Mark Kniese; Rex Ellis; Rodrigo Gutierrez
Cc: Kyle Crane; Jonathan Connelly; Mark Kniese; Jamie Blender
Subject: RE: SPCX2115 W3267R2
Attachments: W3267R2.xls

Mark,

Here's what I have for this pneumatic, adding the pneumatic ball valve for the auto solvent flush to the 7th manifold station with a 2-position solenoid.

All other dispense, pneumatic schematics & documentation are completed in the project rework folders.

Thanks,

Ted

From: Ted St. Marie
Sent: Monday, October 14, 2013 1:08 PM
To: Kyle Crane; Jeffrey Van Norden
Cc: Jonathan Connelly; Mark Kniese; Jamie Blender
Subject: RE: SPCX2115 W3267R2

Kyle,

I just got this back and I'm finishing up on it now, I'll let you know when I'm done.

Thanks,

Ted

From: Kyle Crane
Sent: Monday, October 14, 2013 10:57 AM
To: Jeffrey Van Norden
Cc: Jonathan Connelly; Mark Kniese; Jamie Blender; Ted St. Marie
Subject: RE: SPCX2115 W3267R2

Jeff,

Is the pneumatic BOM going to be updated for the pneumatic ball valve or is that not going to be controlled by the manifold?

Best Regards,

Kyle Crane



Production-Reworks



: (518) 371-2684 Ext: 2433



: KCrane@pva.net

From: Ted St. Marie
Sent: Monday, October 14, 2013 10:50 AM
To: Kyle Crane
Cc: Jeffrey Van Norden; Jonathan Connelly; Mark Kniese; Jamie Blender
Subject: RE: SPCX2115 W3267R2

I no longer have that paperwork, I'm guessing that project was reassigned when I was out last week?

Thanks,

Ted

From: Kyle Crane
Sent: Monday, October 14, 2013 10:46 AM
To: Ted St. Marie
Subject: SPCX2115 W3267R2

Is SPCX fully updated?

Best Regards,
Kyle Crane



Production-Reworks



: (518) 371-2684 Ext: 2433



: KCrane@pva.net

	A	B	C	D	E	F	G	H	I	J	K	L
1												
2	E32-0149R2											
3	MACHINE 2300											
4	8 STATION											
5	Station	Description	A-port Function	A-port Label	B-port Function	B-port Label	Regulator Label	Solenoid Type	Head Pos.	Sensor Number	Output Number	Material
6	1	Z-SLIDE	DOWN	860	UP	861		2POSS		59	25	
7	2	ATOM	ON	862	PLUG	864	863	2POSS	VLV1		28	
8	3	VALVE	OPEN	865	CLOSE	868		2POSS	VLV1		27	
9	4	Z-SLIDE	DOWN	867	UP	868		2POSS	VLV2	54	28	
10	5	ROTARY	4DOES	869	DOES	880		3POSC	VLV2	56,59	28,30	
11	6	VALVE	OPEN	861	CLOSE	862		2POSS	VLV2		31	
12	7	BALL VALVE	OPEN	863	CLOSE	864		2POSS			32	
13	8	SPARE	*****	965	*****	966		BLANK				
14												
15												
16		Rules for Sensor	Sensor									
17		Input #	Number			VALV1	VALVE LAYOUT	VALV2				
18						FCS100-ES		FC100				
19		Low Level (met.)	49									
20		PIP (Conveyor)	60,61,62									
21		Pneumatic	63+									
22		PIP (Fixture)	Next			LEFT	FRONT TO					
23		SPARE	65,66,67				PIP LAYOUT					
24		Needle Cal. in place	61,62,63			PIP #1	PIP #2	PIP #3				
25			64			50	51	52				
26		Low Exhaust PUMP	71				FRONT					

Serial Tag Order form

Project Information:

Job #: SPCX2115
Module type: PVA350

Serial Tag Information:

MODEL: PVA350
SERIAL NUM.: W3267
BOM NUM: B00-3158
VOLTS: 120V
AMPS: 12A
INTERRUPTING CAPACITY: 200kA
FREQ.: 60Hz
PHASE: 1 ϕ
PSI: 80-100

Date Required: ____/____/____

PVA\SPCX2115\W3267\Doc\

Workcell Specification

Customer: SpaceX
 Job Number: SPCX2115
 Rev. Description:

Rev.: A
 Rev. Date:

Date Created: 04/24/09 Date Completed: 04/27/09 Engineer: AFD

Options	#1 W3267	Notes
Machine Type		
250,350,650,850,2000,3000	350	
Custom (y/n)	No	
Motion Axes:	3	
Controller Axes:	4	
Controller: (1500/2000)	2000	
X-Stroke:	~400 mm	
Y-Stroke:	~400 mm	
Z-Stroke:	~90 mm	
CE required: (y/n)	No	
Outlet type(Country)	N/A	
Head 1:	Spray Valve	
Z-slide (y/n):	Yes	
Stroke Adjust: (y/n)	No	
Rotary (y/n):	No	
Size 7 or 10:	-	
Valve:	FCS300-ES	
Atom Air range:	0 - 5 psi	
O-ring material:	Kalrez	
Head 2:	Dispense Valve	
Z-slide (y/n):	Yes	
Stroke Adjust: (y/n)	No	
Rotary (y/n):	Yes	
Size 7 or 10:	7	
Valve:	FCM100-22G	
Atom Air range:	-	
O-ring material:	Kalrez	
Head 3:		
Z-slide (y/n):		
Stroke Adjust: (y/n)		
Rotary (y/n):		
Size 7 or 10:		
Valve:		
Atom Air range:		
O-ring material:		

8/25/2017

Head 4:		
Z-slide (y/n):		
Stroke Adjust: (y/n)		
Rotary (y/n):		
Size 7 or 10:		
Valve:		
Atom Air range:		
O-ring material:		
Laser Height (y/n):	No	
Laser Pointer (y/n):	No	
Prog. Camera (y/n):	Yes	
Head tooling:	Standard 3 Axis, 2 Valve	
Custom:	No	
Double tooled:	No	
Other:	-	
Conveyor:	None	
Type: (Belt/Chain)		
Direction (LtoR, RtoL)		
Conveyor length:		
Conveyor height:		
SMEMA:		
Bi-Directional: (y/n)		
Upstream/Downstream		
PIP Sensors:		
Auto width adj.:		
Hand crank width adj.:		
Lift and locate:		
Board locators:		
Board stops: (Type)		
Quantity on front rail:		
Quantity on back rail:		
Part Fixturing:	Yes	
Flex Fixture:	Yes	
Part present sensor:	No	
Custom Fixture:	No	
Work height:	-	
Cycle Start:	Hand Start	
Hand start:	Yes	
Single zero force:	No	
Double zero force:	No	
Controller: (y/n)	No	
Push button:	Yes	

8/25/2017

Guarding:		
Doors:	Yes	
Interlocks: (y/n)	Yes	
Light curtain:	No	
Light tower:	No	
Process Controls:		
Flow Monitor:	No	
Remote transmitter: (y/n)	-	
Gear style: (y/n)	-	
Low level:	No	
Auto Crossover:	No	
Computer:	Yes	Customer Supplied
Portal OIT: (y/n)	No	
Bar code reader:	No	
A/B Box: (y/n)	No	
Data Logging:	No	
Needle Calibration:	No	
Black light	No	
Cycle rate (sec.)	Unknown	
Air Requirements:		
PSI:	20 - 100	
Dry: (y/n)	Yes	
Lubricated: (y/n)	No	
CFM:	< 10	
Ventilation:		
Minimum CFM:	300	
Flange dia. : (4" or 5")	5"	
PVA blower: (y/n)	No	
Blower exit diameter:	-	
Exhaust switch: (y/n)	Yes	
Supply Voltage:		
120VAC:	Yes	
220VAC:	No	
Frequency:	60 Hz	
Current:	12A	
Phase:	Single	
Coating Material:		
Material A:	SCC NVOC	
Material B:		
Solvent:	None	
Kalrez O-rings? (y/n)	Yes	

8/25/2017

Material Delivery:		
<i>Pressure vessel:</i>		
1gal:		
2gal:	1	Feeding both valves
5gal:		
10gal:		
<i>Cartridge Supply:</i>		
2.5oz:		
6oz:		
12oz:		
20oz:		
32oz:		
<i>Cartridge drive:</i>		
Servo:		
Pneumatic:		
<i>Syringe Supply:</i>		
3cc:		
5cc:		
10cc:		
30cc:		
50cc:		
<i>5 gal. Pumping System:</i>		
Pump ratio:		
Solvent Cup(s):	2	
Purge Pan/Cup(s):	2	
Other:		
Spare parts kit:		

8/25/2017

PVA 350

P/N: SPCX2115 S/N: W3267

Production & Quality Control Manual

April 27, 2009

Customer Name	SPACE X
Machine Type	WORKCELL
Serial Number	W3267
Estimated Ship Date	
Mechanical Engineer	Alex Duggan
Electrical Engineer	Mark Kniese
Programmer	

Construction Checklist

Purpose

The purpose of the following inspection checklist is to document the different stages of building a PVA. Hopefully we can increase the quality and, at the same time, decrease the time it takes to build the machine. At the end of this checklist is a COMMENT section. Use this section to explain any problems that come up during the construction or programming phases of the machine, or for commenting on anything you feel may be important about the machine. Any ideas about improving the design or assembly procedure are also welcome.

It is very important that the drawings (mechanical, electrical, pneumatic, etc.) for the machine match what is actually on the machine. It is up to the person(s) building the machine to make a note when there has been a change made or when they find discrepancies between the drawings and the actual machine. If possible, make the corrections directly on the drawing in red ink. Otherwise, make a note in the COMMENTS section. Either way, make the project engineer aware of the change so that corrections may be made.

Please initial the following sections as they are completed. Anyone may initial the Checked by section. Craig Tuttle will initial the Final Inspection section.

Frame

Use the jigs to ensure that all spacing between extrusion rails is uniform. Using the jigs is important because inconsistencies in rail spacing will decrease the life of the ballscrew slides. Also be sure to check the tightness of all M8 bolts with the short end of an Allen wrench after the frame is assembled. Make sure to check extrusion for any digs or scratches before assembly. If the defect is small enough, it can be hidden in the back of the machine. Otherwise, the piece of extrusion must be replaced.

For any questions concerning the frame, see the project engineer.

Before signing off this section, check that the following items have been taken care of.

1. Frame members are properly squared.
2. Frame member connections have been secured with the short end of a standard L-wrench. It is **NOT** necessary to use excessive force.
3. All stickers have been removed.
4. All smudges and marks have been wiped from exposed aluminum surfaces.
5. Any ugly marks on the extrusion are hidden.
6. All exposed connectors have Bosch covers in place.

Built By		Date:	
Checked By		Date:	

Top Frame/Motion Platform

Assemble the gantry as outlined in *Assembly Procedure for 3 Axis Gantry*, which is located in the PVA-350 *Assembly Instructions* binder. Assembling the 3 axes should be standard for almost all machines. However, each machine will vary somewhat after that point. Installation of a fourth axis, a z-slide, or some other special

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